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SAN FELIPE—THE HURRICANE OF SEPTEMBER 13, 1928

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Meteorologist.

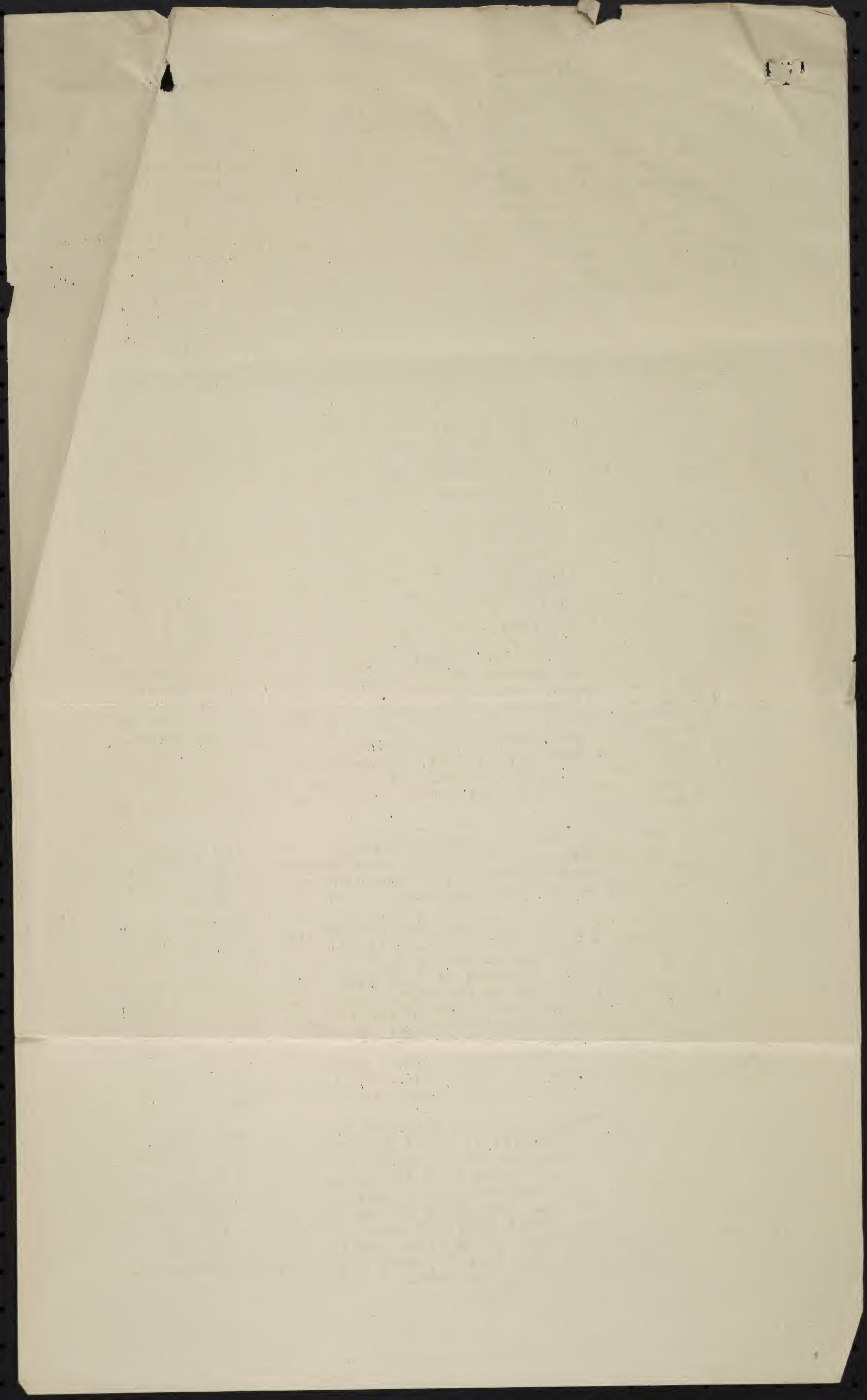
On Tuesday morning September 11th a message was received from the Weather Bureau Office in Washington announcing a tropical disturbance in latitude 15°N. and longitude 50°W. There was no evidence of a disturbance on the morning map of the 11th. At 3 p.m. upon receipt of special reports, changes in wind direction at Saint Lucia and Barbados were signs of an approaching tropical disturbance. At the same time a radio report to Barbados from the S/S "Inanda" was intercepted by the Ensenada Radio Station indicating that a storm of considerable intensity was raging over the Atlantic about 300 miles east of the Leeward Islands. These were the first indications of the approach of a storm towards Porto Rico. The vessel report was incomplete making it impossible to locate the center of the storm accurately. At the time of the evening observations of the 11th the lowest barometer reading was 29.76" at Barbados.

At 8 a.m. of the 12th a well formed cyclonic disturbance was evidently centered to the east of Dominica, which reported a north-west wind of 20 miles per hour and a barometer of 29.50 inches. At 1 p.m. of the 12th the lowest barometer was 29.32 inches with a west wind of 40 miles per hour at Dominica.

As September storms usually move in a west-northwest direction at an average speed of 12 to 13 miles per hour, the San Juan radio broadcast of Tuesday evening stated that the storm would move west-northwest and that the center would probably pass south of the Island of Porto Rico Wednesday night or Thursday morning. This information was broadcast from the Naval Radio Station at San Juan every two hours from 8 p.m. Tuesday night. The warning was telegraphed to the 75 Police Districts of Porto Rico and otherwise given general distribution over the Island. Observations from the Lesser Antilles on Wednesday morning still indicated that the vortex of the storm would pass at some distance south of Porto Rico. Information contained in the 6 p.m. observations of Wednesday the 12th indicated that the storm was centered farther northward than was anticipated and that the center would probably pass directly over the Virgin Islands and Porto Rico. This information was given prompt distribution throughout the Island. At the same time hurricane warnings were ordered up at St. Thomas and at twelve ports along the coast of Porto Rico.

The storm broke over the southeastern portion of the Island early Thursday morning with the center near Guayama and passed across the Island in a west-northwest direction, leaving between Aguadilla and Isabela. The storm center moved across the Island in about eight hours at the rate of 13 miles per hour. The barometer, as the center passed to the south of San Juan at 2:30 p.m., registered the very low reading of 28.75 inches (28.81 inches reduced to sea-level). (See chart No. 1). At Humacao on the east coast of Porto Rico a reading of 28.04 inches was recorded at 1:50 p.m. Ponce reported 28.27 inches at 4:30 p.m.; Arecibo on the north coast 28.75 inches at 3:30 p.m.; Isabela on the northwest coast 27.80 inches at 9: p.m.; Mayaguez on the west coast 28.60 inches at 8 p.m. Guayama on the southeast coast reported the lowest barometer (27.50") at 2:30 p.m. (27.65" reduced to sea-level). (See chart No. 2). Guayama, Cayey and Aibonito reported a period of calm or light winds lasting 20 to 30 minutes, indicating that the storm center passed over these towns.

The steamship "Matura" of the Trinidad Line reported a barometer of 27.50 inches (sea-level) about 10 miles south of the Island of St. Croix. As a reading of 27.72 inches was reported at West Palm Beach Florida it would seem that the intensity of the storm remained about the same from the Lesser Antilles to Florida—a distance of about 1700 miles. The storm center apparently kept its initial course west-northwest until it reached Florida, with an average progressive movement of 13 miles per hour, when the path turned to the northwest over Florida, then northward and northeastward across New York State on the 20th.

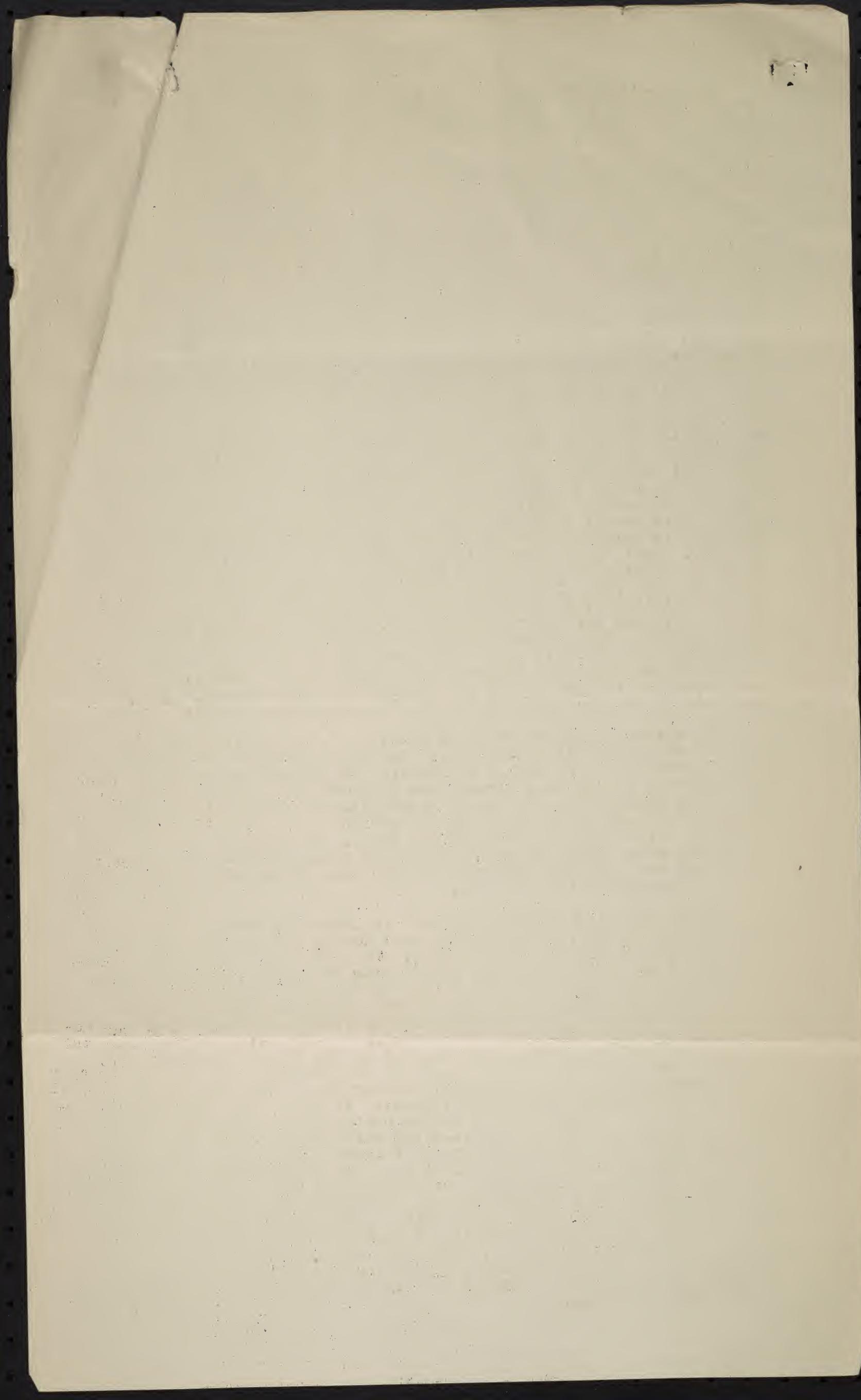


RAINFALL:-The rainfall of the 13th and 14th was the heaviest ever recorded in Porto Rico during the past 30 years. Unfortunately reports from the special observers of the Weather Bureau showed a high percentage of overturned raingages. In addition, the great velocity of the winds made it impossible to register more than 50 to 75 percent of the amounts which actually fell. Along the coast the rainfall was generally below 30 inches. In the regions of greatest normal rainfall--the vicinity of Adjuntas in the Central Cordilleras and in the Luquillo Mountains the amounts exceeded 25 inches. The approximate distribution of rainfall is shown on the accompanying chart (No. 3). Adjuntas, in the central Mountain region, reported the phenomenal fall of 29.60 inches, a record which will have to be examined more carefully before being finally accepted. At San Juan the raingage was overturned before the height of the storm was reached and probably only 50 percent of the total amount which fell was recorded. It is estimated that the amount should be approximately 10 inches.

WINDS.- At 11:44 a.m. of the 13th the anemometer at the Office of the U. S. Weather Bureau in San Juan lost one of its cups--just after recording a maximum velocity (the greatest velocity in 5 minutes) of 150 miles per hour, and an extreme velocity (the highest velocity in one minute) of 160 miles. These velocities probably exceed all official records of the Weather Bureau for similar storms. San Juan was about 30 miles from the storm center when these velocities were recorded. Estimates of 200 miles per hour near the center of the storm appear to be not much overdrawn. At San Juan the storm increased in intensity for three hours after the record of 150 miles was made. Most of the damage to property on the Weather Bureau Reservation occurred between 2.30 and 3.30 p.m. The balloon shed collapsed at 2.30 p.m. The residence of the Official in Charge began to lose portions of the roof about the same time and the entire roof and the ceilings were carried away by 3.30 p.m. With only two cups the anemometer still recorded about 75 miles per hour. The second cup disappeared at 12.47 p.m. The arms and the shaft of the anemometer with one cup still attached were blown away at 1.33 p.m.; these parts were later found at San Antonio Docks, a distance of a third of a mile to the southwest of the Weather Bureau wind tower.

The nearest approach to the intensity of "San Felipe" was "San Ciriaco" on the 8th of August 1899. The paths of these two storms across Porto Rico were almost identical. The highest velocity of the wind recorded at San Juan during "San Ciriaco" was 85 miles per hour on a 4-cup anemometer. The 3-cup anemometer in service at San Juan during the recent storm registers 30 percent less than the 4-cup variety at velocities in excess of 100 miles. In other words, the 4-cup anemometer still in use at Weather Bureau stations would have registered not less than 190 miles at San Juan on the 13th at the time the anemometer lost one cup.

During the storm of "San Ciriaco" on August 8, 1899 it was estimated that fully 3,000 lives were lost during the progress of the storm across the Island of Porto Rico. Most of these fatalities were caused by floods. Loss of life during the recent storm of "San Felipe" will not exceed 300 due mostly to the fact that the approach of the storm was announced in time to take necessary precautions against loss of life. The lowest barometer reading recorded in 1899 was 27.75 inches at Guayama. The lowest recorded during the recent storm was 27.65" at Guayama. The center of the storm passed over the northern portion of the French Island of Guadeloupe in the Lesser Antilles--moved west-northwestward, passing about 10 miles to the south of St. Croix in the Virgin Islands. It entered Porto Rico on the southeast coast and left it on the northwest coast--passed to the north of Santo Domingo and Haiti--doing very little damage in these islands; passed to the south of Turks Islands and Nassau in the Bahamas and entered Florida at West Palm Beach on the morning of the 16th. The French Island of Guadeloupe reported heavy loss of life and great property damage. The English Islands of St. Kitts and Montserrat, a short distance to the north of the path of the storm also suffered heavy losses. The lowest barometer at St. Thomas, V.I., 50 miles north of the path, was 29.30 inches, with a maximum wind velocity of 90 miles per hour at 10 a.m. of the 13th. The Island of St. Croix, V.I., within 10 miles of the center, suffered heavily in loss of life and damage to property and crops.



AREA OF WINDS OF HURRICANE FORCE:-Guayama, on the southeast coast of Porto Rico, was in the vortex of the storm at 2.30 p.m. of the 13th. Winds of hurricane force prevailed from 4 a.m. to 10 p.m., a period of 18 hours—assuming a progressive movement of 13 miles per hour for the storm, the area of winds of hurricane force east and west, would be about 234 miles. At San Juan, 30 miles to the north of the vortex, hurricane winds prevailed from 4 a.m. to 4 p.m., or 12 hours.

Winds of hurricane force were experienced throughout the Island to the north of the path; to the south some portions of the coast were apparently free from hurricane winds. The north-south extent of hurricane winds is a matter of conjecture in the absence of vessel reports either to the north or south of Porto Rico during the storm. A fact worthy of notice is that few vessel reports were received at any time during the progress of the storm, indicating that timely warnings held vessels in port or kept them away from the zone of danger. In San Juan harbor several vessels delayed sailing for 24 to 48 hours. In spite of the great intensity and great extent of the storm no reports of loss of vessels in the vicinity of Porto Rico have been reported.

STORM DAMAGES IN PORTO RICO:- As stated above the loss of life during the storm will approximate 300. Several hundred thousand people were rendered homeless. Some towns near the center of the storm were practically leveled. The principal crops of the Island are sugar, tobacco, coffee and citrus fruits. Sugar and tobacco interests lost heavily but are generally controlled by large corporations, able to take care of themselves. The heaviest property losses were sustained by the coffee growers who had in sight one of the largest and best crops in recent years. In addition to the loss of the crop the shade trees, requiring years to replace were largely destroyed. The citrus fruit growers lost their entire crop, but most of the trees were saved. Property and crop losses are estimated at approximately \$50,000,000.

STORMS OF 1928:-The storm of September 13th was the 4th to pass across the West Indies during the present hurricane season. All of these came into view to the eastward of the Windward Islands. Three of them struck Florida, inflicting a heavy toll of life and great property losses. (See chart No. 4). Reports of the wreckage of the storm of September 13th, "San Felipe" will probably confirm statements made that it was the most destructive storm on record in the West Indies. The extremely low readings of the barometer (27.50") and the unparalleled intensity of the winds experienced will substantiate the claims.

SAN CIRIACO AND SAN FELIPE LOSSES COMPARED:-

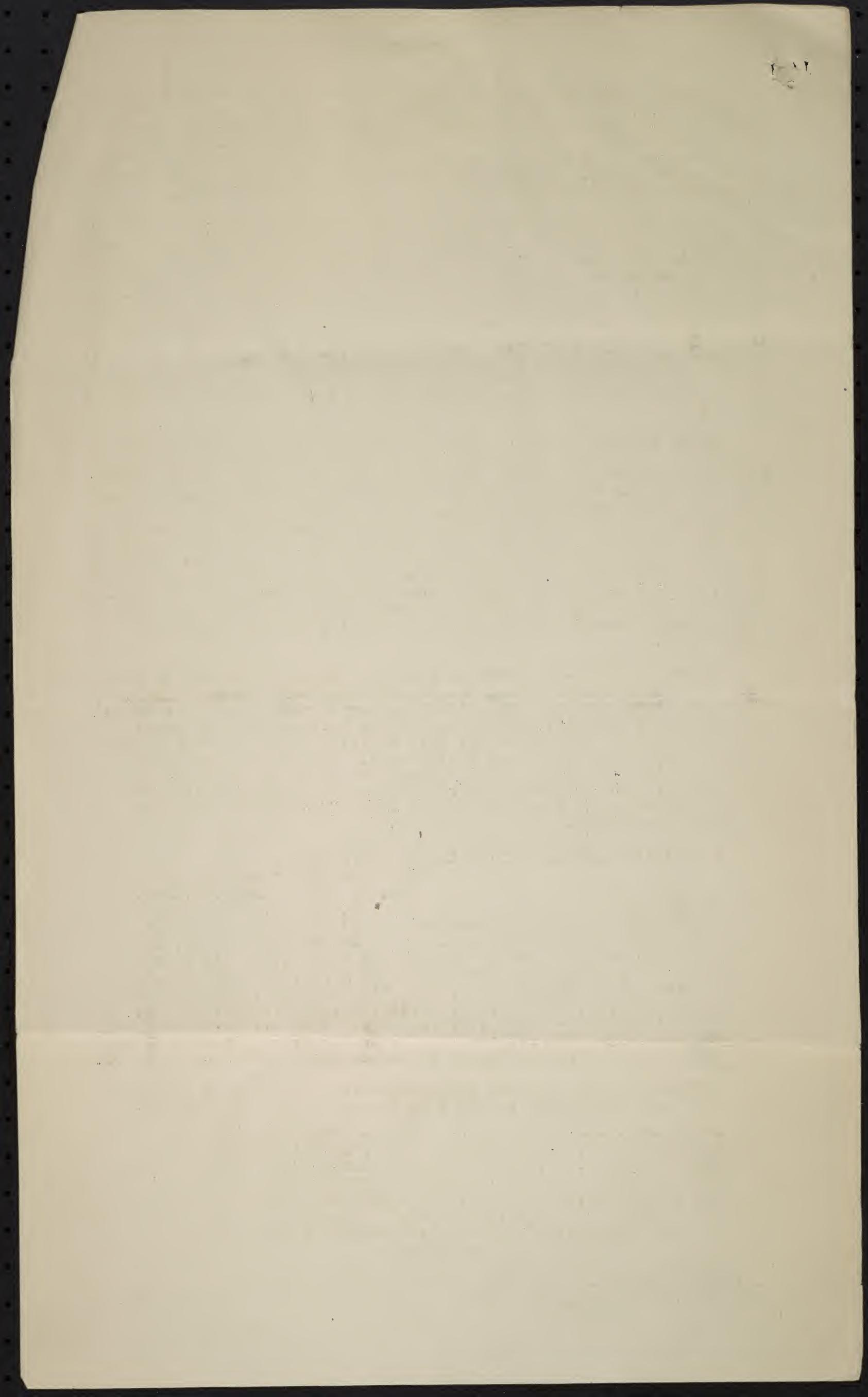
	"San Ciriaco"	"San Felipe"
	Aug. 8, 1899	Sept. 13, 1928.
Loss of life in Porto Rico.....	3,000	300
Lowest barometer reported at Guayama	27.75"	27.65"
Lowest barometer at San Juan.....	29.23"	28.81"
Duration of hurricane winds at San Juan	3 hours	12 hours
Maximum velocity of wind at San Juan..	75 m.p.h....	150+m.p.h.
Advance warnings of storm.....	*18 hours.....	36 hours.
Property losses.....	\$20,000,000....	\$ 50,000,000.
Greatest rainfall at Adjuntas, P.R....	25.00 inches..	29.60 inches.

* Owing to lack of facilities for prompt distribution of the warning to the rural population, the storm struck them unannounced.

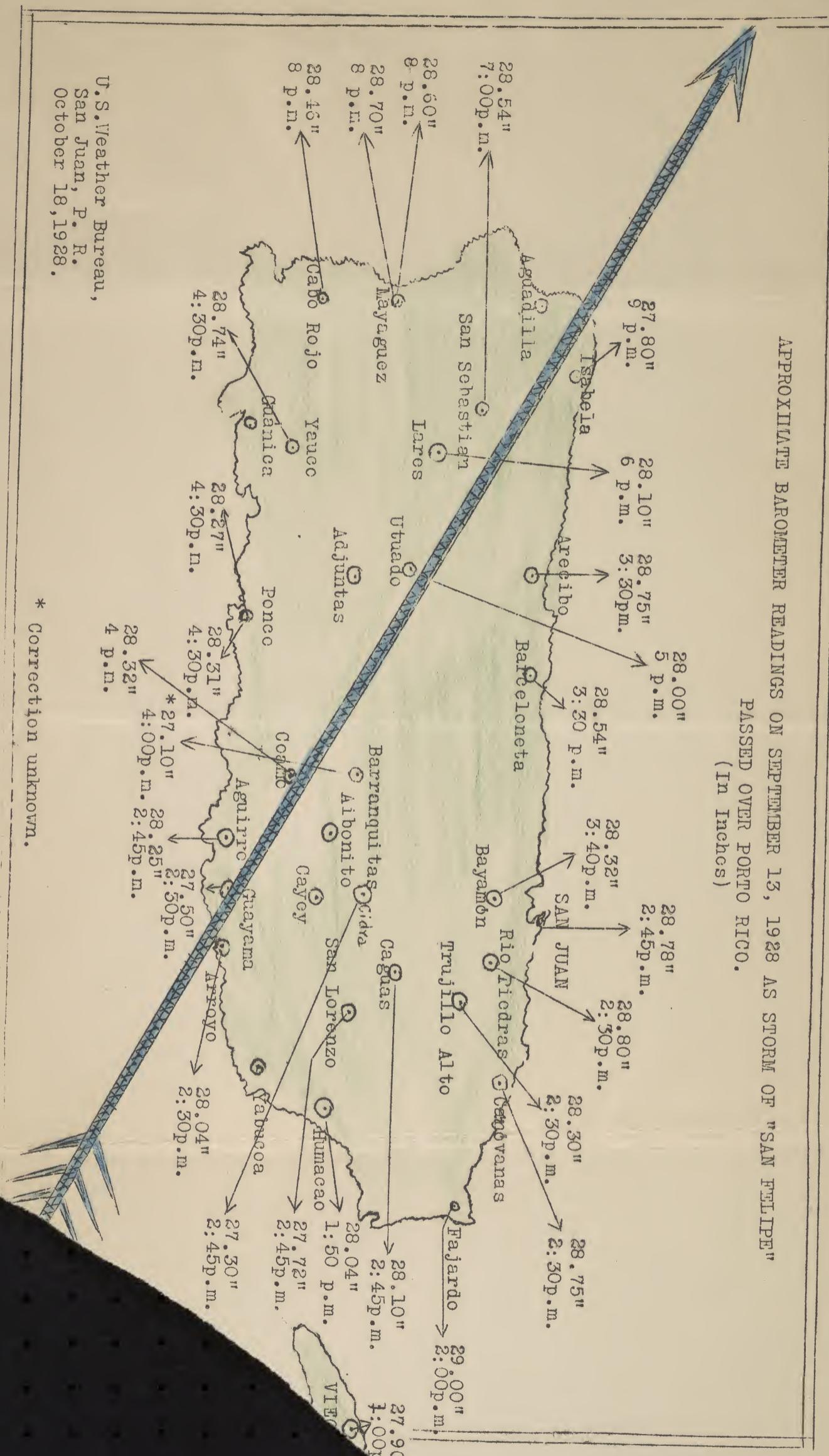
HISTORIC STORMS OF PORTO RICO:-Hurricanes of the past 100 years which are most frequently referred to because of their violence:-

Santa Ana	July 26, 1825.
Los Angeles	August 2, 1837.
Santa Elena	August 18, 1851.
San Narciso	October 29, 1867.
San Felipe (No. I)	September 13, 1876.
San Ciriaco	August 8, 1899.
The 2nd "San Felipe".	September 13, 1928.

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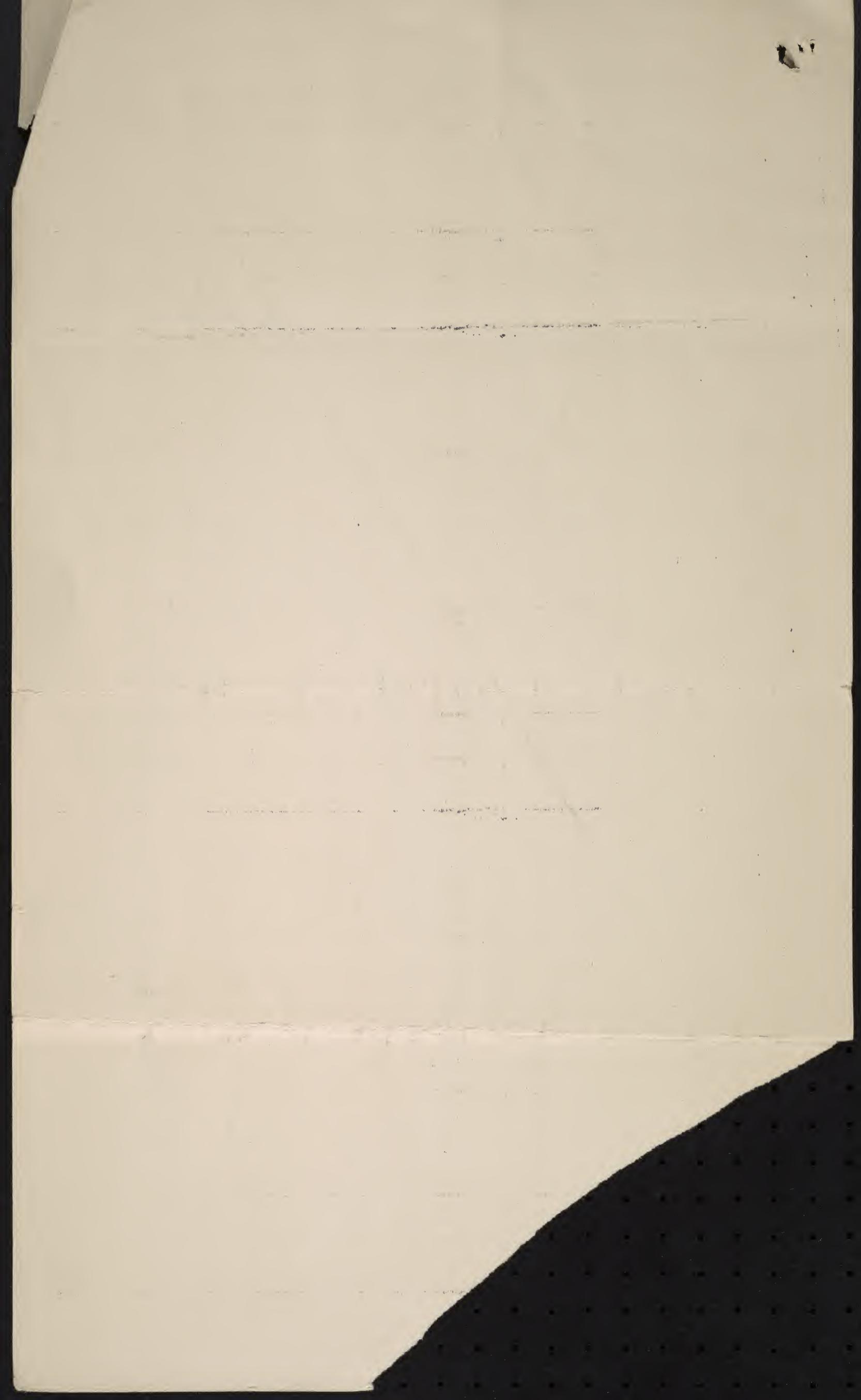


APPROXIMATE BAROMETER READINGS ON SEPTEMBER 13, 1928 AS STORM OF "SAN FELIPE"
PASSED OVER PORTO RICO.
(In Inches)



U.S. Weather Bureau,
San Juan, P. R.
October 18, 1928.

* Correction unknown.



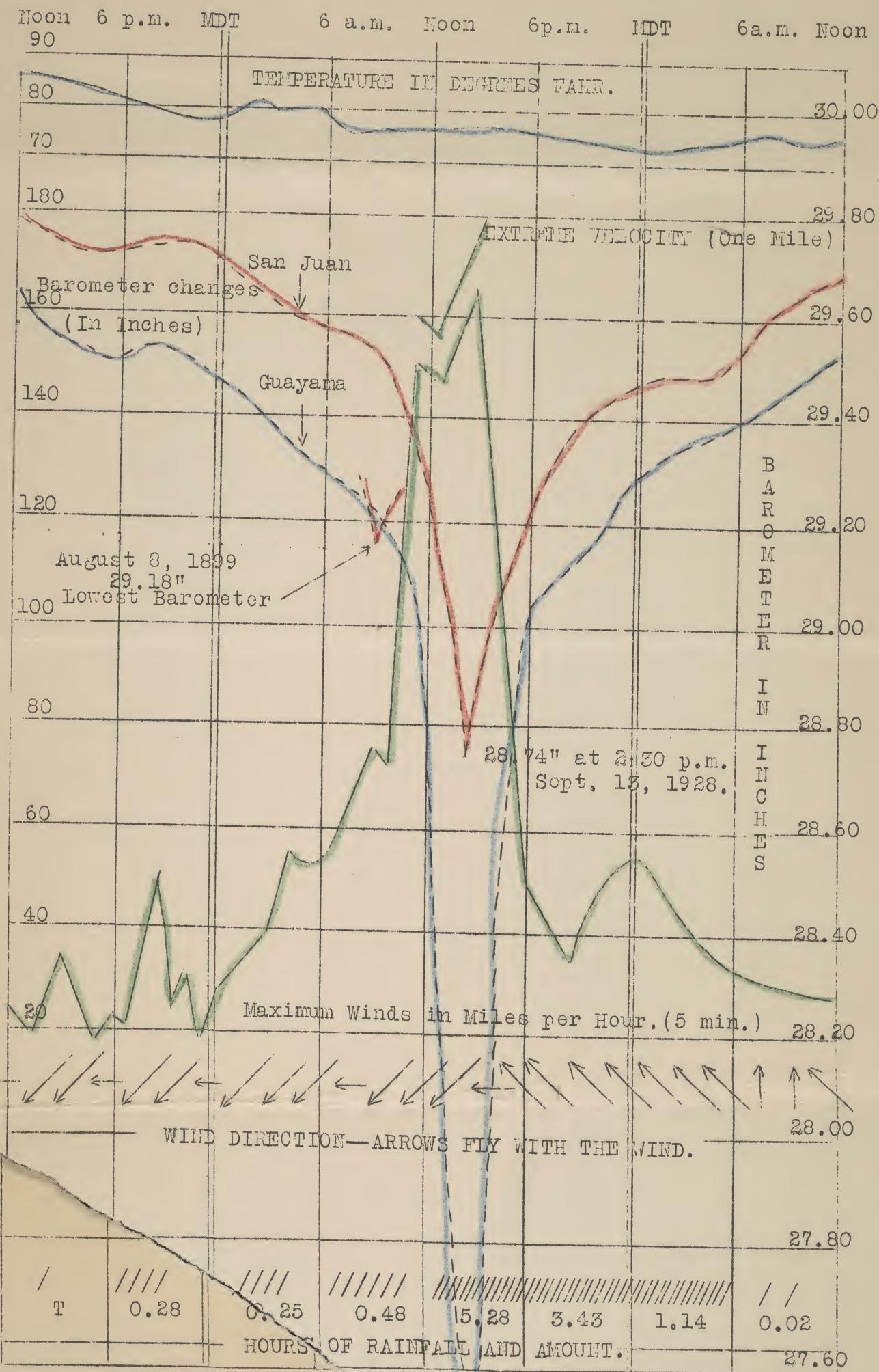
SAN FELIPE—THE HURRICANE OF SEPTEMBER 13TH, 1928.

U. S. WEATHER BUREAU, SAN JUAN, PORTO RICO.

12th

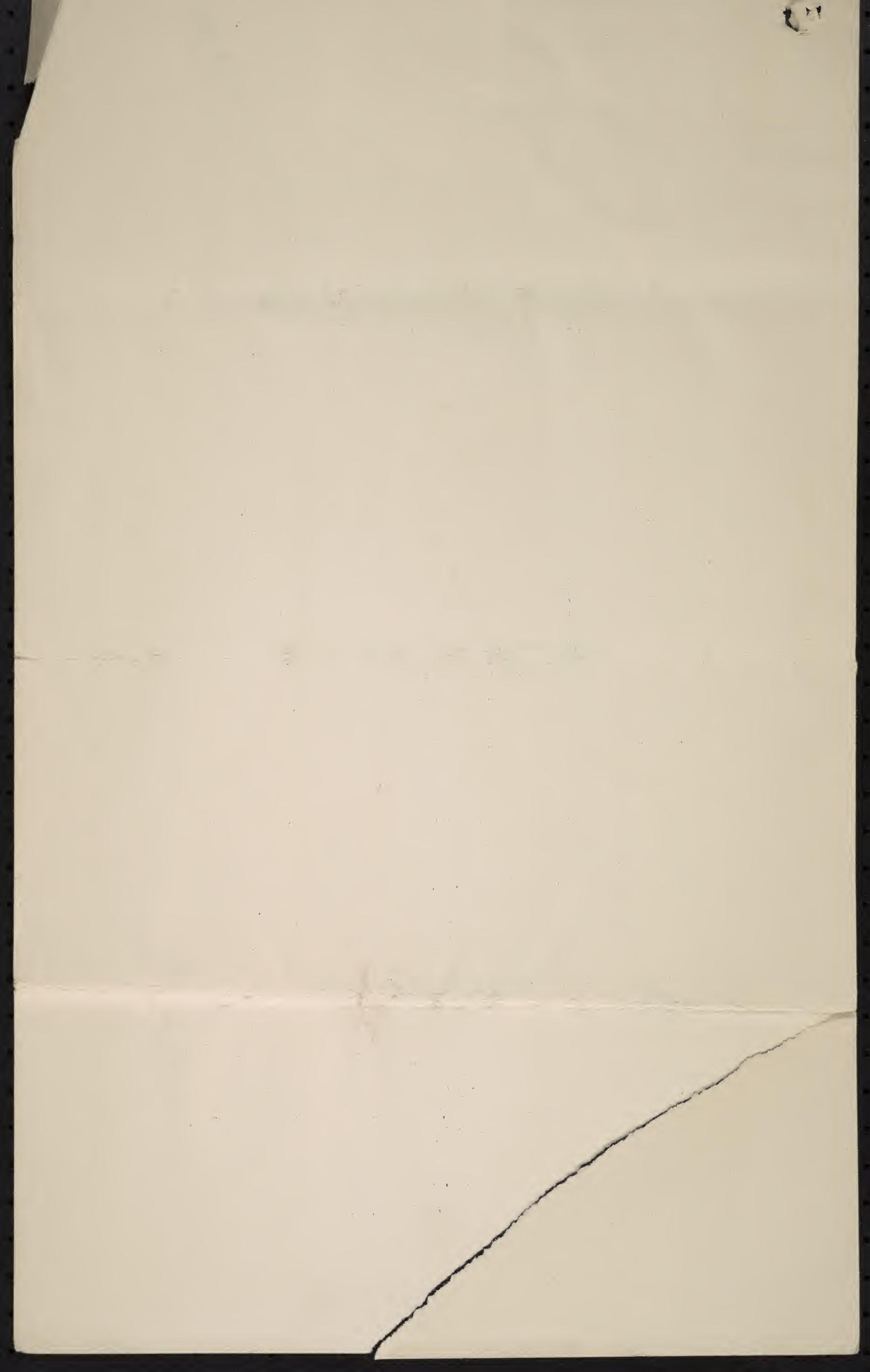
September 13, 1928.

14th

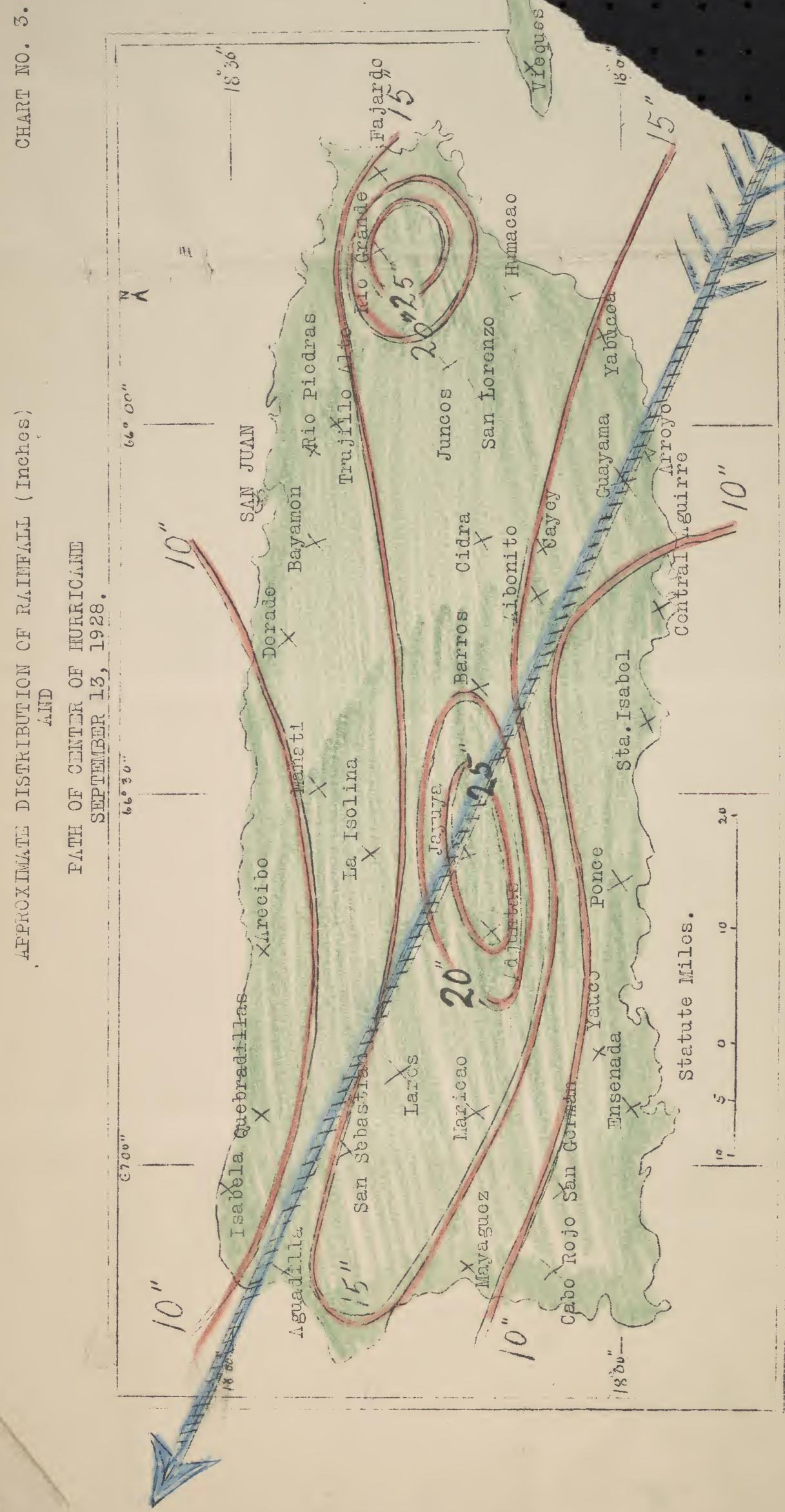


October 18, 1928.

27.50°
Guayama, P.R.U.S. Weather Bureau
Oliver L. Fassig,
Meteorologist.



APPROXIMATE DISTRIBUTION OF RAINFALL (Inches)
AND
PATH OF CENTER OF HURRICANE
SEPTEMBER 13, 1928.



October 18, 1928.

U.S. Weather
San Juan

